Chapter X: Product Specifications

One of the primary goals of the National Park Service Inventory and Monitoring Program is to make existing and new natural resource information more available and useful to park managers, scientists, and educators for planning, management, research and education. The I&M Program is coordinating the development of an integrated set of modern GIS and database tools and an overall framework for organizing, storing, displaying, and analyzing natural resource information. This document presents an overview of these tools and technical specifications for products developed by NPS staff, cooperators and contractors for work funded by the I&M Program. The specifications presented here are a "work in progress", and the most recent version of this document and updates on the development of the information management tools being developed by the NPS can be found at http://www.nature.nps.gov/im/apps/specs.htm.

The National Park Service has adopted certain word processing, database, and GIS software as the standards to promote compatibility and sharing of data among parks and promote the development of data management tools to make information more available:

- Microsoft Word is the standard for word processing, and all reports and documents must be delivered in electronic format in MS Word 97 format unless otherwise specified by the park.
- MS Access is the standard for distributed databases, and most parks throughout the NPS will be using the Natural Resource Database Template (see below).
- GIS products must be compatible with the ArcView GIS and have FGDC-compliant metadata.
- Metadata for non-spatial data products (e.g., databases, data files, photographs, field data forms) should be entered into the Dataset Catalog.
- Species information will be entered into the NPSpecies database, or compatible format for merging into NPSpecies. Information for voucher specimens must be entered into the ANCS+ application (which can then be electronically imported into the Voucher table of NPSpecies).
- Bibliographic citations are to be entered into the NPBib database.

Specifications and data dictionaries for each of these databases and applications are presented below or are available from the Product Specifications website at http://www.nature.nps.gov/im/apps/specs.htm

X.1 National Park Service Information Management Tools

The NPS is developing a framework for information management that includes a series of web-based master databases that are linked together, and a set of corresponding distributed databases in MS Access that allow users to download the latest version of data for their park from the master web-based version into MS Access for local use. The applications for which there will be both a master web-based version and a distributed MS Access version available in 2001 include NPSpecies, NPBib, and the Dataset Catalog. The GIS Theme Manager and an initial version of the NR Database Template (a relational MS Access database for storing raw data that can be

used in conjunction with the GIS Theme Manager) is available. A brief overview of each of these products and how they can be obtained is as follows:

X.1.1 GIS Theme Manager

The GIS Theme Manager is an Arcview extension that can be used as a stand-alone application or in conjunction with the NR Database described below as a means of organizing and displaying integrated natural resource information. The Theme Manager has the full functionality and spatial data analysis capabilities of ArcView for those who routinely use GIS, but can also be used by someone with only a few hours of training to display integrated natural resource information for planning, park operations, and decision-making. GIS products must be compatible with the GIS Theme Manager and have fully FGDC-compliant metadata. Parks are encouraged to compile reports and other data products as Windows help files and link them to GIS themes in the Theme Manager. Details can be found at http://www.nature.nps.gov/im/apps/thmmgr.htm

X.1.2 Natural Resource Database Template

The Natural Resource Database Template is a flexible, relational database in MS Access for storing inventory and monitoring data (including raw data collected during field studies). This relational Access database can be used as a standalone database or in conjunction with the GIS Theme Manager to enter, store, retrieve, and otherwise manage natural resource information. The template has a core database structure that can be modified and built upon by different parks and networks depending on the components of their inventory and monitoring program and the specific sampling protocols they use. Modules that will include a written sampling protocol, database table structure, data entry forms and quality checking routines, and queries and reports will be coordinated by the Servicewide I&M Program and made available through a web-based clearinghouse. Each module will be based on a standard sampling protocol. A description of the template and data dictionary is included as Appendix A. The most recent version and details can be found at http://www.nature.nps.gov/im/apps/template.htm

X.1.3 Dataset Catalog

The Dataset Catalog is a tool for keeping an inventory and providing abbreviated metadata "metadata light" about a variety of natural resource data sets, from physical files and photographs to digital scientific and spatial data. The federal government requires that spatial data have fully FGDC-compliant metadata, but for non-spatial data the Dataset Catalog provides a means for parks to keep an inventory of various data files, notebooks of field data forms, photographs, etc. The one-page input and report forms provide a straightforward way to document all types of resource data that may or may not meet formal metadata standards. As with other NRPC applications, the master version of the Dataset Catalog will be available through a website and will be linked to NPSpecies (the NPS Species database) and NPBib (the bibliographic database). It will also be possible to download a version in MS Access from the website. A printout of a data entry form that lists the information that should be entered into the Dataset Catalog is included in Appendix C. For a copy of the application and details, see http://www.nature.nps.gov/im/apps/datacat.htm.

The purpose of the Dataset Catalog is to provide a single source for information about existing data on parks' natural and cultural resources and to combine the individual databases into a

Servicewide catalog of park-based data. The original goal for catalog records consisted of a single page per data set. The current version (v2001.1) of the Dataset Catalog consists of a relational database that can be shared among NPS units and included in the Servicewide system on the Internet. The catalog is not intended to be an exhaustive metadata listing but a basis for implementing comprehensive metadata standards later on. Action is currently underway to integrate the Dataset Catalog with the FGDC metadata standard.

X.1.4 NPSpecies

NPSpecies is the master species database for the NPS. The database lists the species that occur in or near each park, and the physical or written evidence for the occurrence of the species (e.g., vouchers and reports). Taxonomy and nomenclature are based on the ITIS, the interagency Integrated Taxonomic Information System. The master version for each park or network of parks can be downloaded from the master website into the MS Access version of NPSpecies. The web-based version will be the master version and will be in active development over the next several years as the biological inventories proceed. The password-protected version now available on the web contains duplicate records, outdated species names, and various errors, and needs to be further developed and cleaned up before any data will be available to the public. NPSpecies is linked to NPBib for bibliographic references that provide written evidence of a species' occurrence in a park. A data dictionary is included in the appendix. The MS Access application and additional details can be found at http://www.nature.nps.gov/im/apps/npspp.htm

X.1.5 NPBib

NPBib is the master web-based database that merges a number of previously separate databases such as NRBib, GeoBib, and others. As with NPSpecies, it will be possible to download data from the master web version into the MS Access version that can be used locally on computers without an internet connection. Details are available at http://www.nature.nps.gov/im/apps/npbib.htm.

X.1.6 ANCS+

ANCS+ is the Automated National Catalog System software distributed by the Museum Management Program of the NPS Cultural Resource Stewardship and Partnerships. All voucher specimens, their associated data and cultural objects collected in national parks are required to be entered into ANCS+, regardless of where they are stored. For voucher specimens, ANCS+ requires the documentation of more information regarding the specimen than does the voucher table in NPSpecies. It is possible to electronically transfer the required fields from ANCS+ to NPSpecies, and parks and their contractors are encouraged to first enter voucher data into ANCS+.

It is essential for an Inventory & Monitoring project's Scope Of Work to define the information that the park expects to be recorded in ANCS+ in relation to each collected voucher. Depending on the species this might include; kingdom, division/class, order, family, genus, species, collection site, date collected, taxonomic serial number (TSN), field number, identified by, date identified, habitat, elevation, universal transverse mercator grid (UTM), latitude/longitude, drainage, fixative & preservative, sex and age (see page 27, Voucher and Observations Form for additional data requirements). Copies of the associated data must be included with the voucher; field notes, maps, raw data, computer printouts, drawings, photographs, negatives and final report. It is important that permanent and durable media are used to properly preserve specimens

and meet archival requirements for the associated data. Cataloging data from voucher specimens must be entered into ANCS+. Funding from this project must be reserved to fund the proper housing and cataloging of these voucher specimens.

A condition of the issuance of the collecting permit is to identify the repository that will house the voucher specimens and associated data collected as a result of each research project. A formal agreement must be established that defines the responsibilities of both the repository and the National Park Service.

X.2 Database Specifications

X.2.1 Database Formats

MS Access is the NPS standard for distributed databases, and raw data should be provided to parks in MS Access. The NR Database Template format is recommended to reduce duplication of effort throughout the NPS and to promote data compatibility and sharing among parks. The Database Template works in conjunction with the GIS Theme Manager. A description of the template and data dictionary is included as Appendix X-1. The most recent version and details can be found at http://www.nature.nps.gov/im/apps/template.htm

For web-based databases, Oracle is the NPS standard. A web browser such as Netscape or Internet Explorer is used to view, enter and edit data in the password-protected master databases, and parks and their contractors do not need to use or know anything about Oracle. Parks and their contractors are encouraged to logon to the master web-based databases and enter and edit data directly, but the Servicewide I&M Program has also developed mechanisms to accept data in MS Access and to have someone in Fort Collins, CO upload the data into the master Oracle databases. Details for each database can be found at the webpages listed in the section above. See Appendix X-2 for the data dictionary for NPSpecies, and Appendix X-3 for data requirements for the Dataset Catalog.

X.2.3 Metadata

The FGDC has developed guidelines for metadata for non-spatial data, but these guidelines are still undergoing review. At a minimum, an abbreviated set of metadata or “metadata light” should be developed by the producer using the Dataset Catalog for all products, such as data files, photographs, etc.

X.3 Spatial Data Specifications

X.3.1 Projections and Coordinate Systems

All digital geospatial should be referenced to two coordinate systems. The first is geographic coordinates (latitude and longitude) represented in decimal degrees; the datum should be the North American Datum of 1983 (NAD83); the ellipsoid should be the Geodetic Reference System 80 (GRS80); the units of measure should be meters. The second coordinate system should correspond to the standard presently in use at the park. The contractor is to contact the park's GIS Coordinator for specific instructions. If a park does not currently have an active GIS program, the data should be referenced to the correct UTM zone in which the park is found; the

datum should be NAD83; the ellipsoid should reference GRS80; the units of measure should be meters.

X.3.2 Scale and Spatial Resolution (Vector Data)
New data should not exceed 1:24,000, e.g. 1:50,000. The contractor should contact the park's GIS coordinator for specific scale and spatial resolution requirements based on the scope of the project.

X.3.3 Scale and Spatial Resolution (Image Data-digital or aerial photography)
The contractor should contact the park's GIS coordinator for specific scale and spatial resolution requirements based on the scope of the project. For vegetation classification under the NPS/USGS vegetation classification project (see http://biology.usgs.gov/npsveg/), the current standard is 1:12,000 color infrared aerial photographs with 60% overlap and 30% sidelap.

X.3.4 Horizontal and Vertical Accuracy
All data should meet or exceed National Map Accuracy standards. For maps on publication scales larger than 1:20,000, not more than 10 percent of the points tested shall be in error by more than 1/30 inch, measured on the publication scale; for maps on publication scales of 1:20,000 or smaller, 1/50 inch. These limits of accuracy shall apply to positions of well-defined points only. Well-defined points are those that are easily visible or recoverable on the ground, such as the following: monuments or markers, such as bench marks, property boundary monuments; intersections of roads and railroads; corners of large buildings or structures (or center points of small buildings). In general, what is well-defined will also be determined by what is plottable on the scale of the map with-in 1/100 inch. Thus, while the intersection of two roads or property lines meeting at right angles would come within a sensible interpretation, identification of the intersection of such lines meeting at an acute angle would not be practicable within 1/100 inch. Similarly, features not identifiable upon the ground within close limits are not to be considered as test points within the limits quoted, even though their positions may be scaled closely upon the map. This class would cover timberlines and soil boundaries. Vertical accuracy, as applied to contour maps on all publication scales, shall be such that not more than 10 percent of the elevations tested shall be in error by more than one-half the contour interval. In checking elevations taken from the map, the apparent vertical error may be decreased by assuming a horizontal displacement within the permissible horizontal error for a map of that scale. Source: USGS Fact Sheet 078-96, September 1997.

X.3.5 Attribute Accuracy
At a minimum, an 80% or greater attribute accuracy at a 90% confidence level is required. The contractor should contact the park's GIS coordinator for specific attribute accuracy requirements.

X.3.6 Spatial Data Formats
At a minimum, all vector data is to be supplied as an Arc/Info coverage and Arc/Info interchange file, e00. All raster data is to be supplied as an Arc/Info GIRD and Arc/Info interchange file. All image data such as aerial photographs are to be supplied as tagged information file format (tiff) files with the proper header file. Data should be delivered on two CD-ROMs.

X.3.7 Quality Control
When the contractor has completed 10% of the spatial and attribute data development, the

contractor will supply the park and Regional Technical Support Center (RTSC) the data for quality control purposes. The data should be delivered in the format specified in the Spatial Data Formats section. Once the park and RTSC have checked the data and found it acceptable, the contractor may continue data development. Once the contractor has completed the work, the park and RTSC must accept the spatial data, attribute data and FGDC compliant metadata before the job is considered complete.

Tests used to verify all applicable horizontal, vertical and attribute accuracy measurements should be provided to the park's GIS coordinator and the RTSC whenever data is provided to the park and RTSC.

X.3.8 Metadata

All digital geospatial data should have Federal Geographic Data Committee (FGDC) –compliant metadata in digital form developed by the producer. The metadata should be parsed using the metadata parser provided by the FDGC, http://www.fgdc.gov. Metadata should be supplied as ASCII text with a .txt extension, hypertext markup language with an html extension and standard general markup language with an sgml extension. The contractor should contact the park's GIS coordinator or the RTSC for metadata development instructions. The RTSC contact is Bill Slocumb at North Carolina State University. He can be reached via email at bill_slocumb@ncsu.edu or by phone, 919.515.3432.

X.4 Guidelines for Writing Progress Reports

The progress report is a brief, informal, narrative statement of the status of all work accomplished during the period specified, and a summary of work to be performed during the following period. A specified number of copies (usually five) is submitted to the designated NPS Key Official on or before the date(s) identified in the research permit, contract, or agreement. Depending on the scope of the project, progress reports are usually required quarterly, semiannually, or annually.

X.4.1 Format

Progress reports should meet the following format guidelines:

- As requested, submit progress reports double-sided and single-spaced on 8 1/2” x 11” white
- bond paper and/or in Word 6.0 (or more recent version) files as an email attachment or on a Windows formatted 3.5” diskette.
- Use Times New Roman 12 pt font.
- Commence pagination on the first page of text as a footer and centered.
- Begin paragraphs left justified without indentation on the first line and separate paragraphs from each other double-spaced.
- Use title case (i.e. first letter of all words capitalized except articles, prepositions, and
- conjunctions) for all section headings.
- Use the following style for section headings:

First Order Header [center]

Second Order Header [flush left]
Third Order Header [flush left, underlined]
Fourth Order Header: [flush left, colon, two spaces, continue with text].
Fifth Order Header [flush left, italicize]

X.4.2 Content
Progress reports should include the following content:

- a title page containing the following information: the words "Progress Report"; title of project; investigator name(s), affiliation, and address; NPS contract, agreement, or purchase order number; date of submission; and time period covered by report,
- a quantitative description of overall progress and significant findings to date,
- an indication of any current problems that may impede performance and proposed corrective actions,
- status of cataloging progress of voucher specimens and associated data, and
- a brief discussion of the work to be performed during the next reporting period.

X.5 Guidelines for writing draft final and final reports

At the completion of a research study, the investigator must submit a draft final report that documents the study methods, results, and conclusions of the entire project as required by the contract. The specified number of copies (usually five to ten) must be submitted to the designated NPS Key Official on or before the date identified in the contract. The report should be written to an "audience" of park managers who may lack training or exposure to the particular discipline. The report may also be distributed to other government agencies, the scientific community, politicians, reporters, and the public. Keep the main body of the report short and concise. This may be accomplished through the use of appendices for extensive literature reviews, detailed explanations of the research design and methods, supplementary data, a list of cataloged voucher specimens, information which does not directly address the research objectives specified by park managers, and highly technical material (equations, statistical analyses, and testing). Write in a non-technical jargon-free style, avoiding or clearly explaining any scientific terms or terms unique to a specific discipline. Your goal is to clearly and concisely convey study results and management implications to a nonscientist. It is very important for purposes of proper review that both the draft and final reports adhere to the format and content guidelines presented in this manual.

Upon submission of the draft final report, the designated NPS Key Official will review the manuscript and seek additional management and scientific review comments from appropriate NPS regional and park personnel and peer members of the scientific community to ensure technical quality and accuracy of information. Review comments and recommended changes will then be returned to the author(s) for consideration and preparation of the final report.

All appropriate comments from draft final report reviews should be addressed and incorporated during the preparation of the final report. Before duplication, a copy of the final report must be sent to the designated NPS Key Official for final approval of review modifications and format. Upon approval, a letter quality original, reproducible copy of the final report and the specified

number of copies (usually ten to fifteen) must be submitted to the designated NPS Key Official on or before the date identified in the research permit, contract, or agreement. A diskette, containing the report in MS Word 97 must be submitted along with the paper copies.

The final report may be printed and distributed as part of an NPS Technical or Natural Resources Report series. Reports printed in these series are not considered formal publications, and the information may be subsequently submitted by authors to peer reviewed journals. The designated NPS Key Official will notify the author of the decision to print the final report in one of the series and will assign the series name and number to be included on the title page. Preprinted front and back covers will be provided for final duplication and distribution.

X.5.1 General Guidelines
The following guidelines pertain to all sections of draft final and final reports:

X.5.1.1 Citing Literature.

- Follow the author and year system for citing literature references in the text. If you wish to mention the author in your discussion say, for example, "Wakeley (1954) reported that...". Otherwise, place the author and year within or at the end of your statement, (Wakeley 1954).
- Semicolons separate citations of works by different authors in one set of parentheses (Wakeley
- 1954; McManus 1957).
- Commas separate several cited works by the same author (Hackett 1970, 1972a, 1972b).

X.5.1.2 Figures and Tables.

- Figures and tables should have brief descriptive titles.
- Numbers and titles for figures should be below the figure and left justified.
- Numbers and titles for tables should be above the table and left justified.
- Explanatory information and keys to symbols should be placed in the legend to the figure or as a footnote at the bottom of the table.
- The title, heading, legend, and footnotes must contain all the information the reader needs to understand a table or figure without referring to the text.
- All figures (including maps and photographs) and tables should be in digital format as part of the final document. If line drawings and artwork are necessary, they must be in high-contrast black and white and of a professional reproducible quality.
- Figures and tables should not be placed on a page with text but should be on their own numbered page immediately following the page (double-sided) in which they are referenced.
- Use sentence case for all figure and table titles.
- Figures and tables, respectively, are numbered sequentially with Arabic numerals in the order of their presentation in the text
- Every table and figure must be cited in the text (e.g. “(Table 1)” or “...in Figs. 2 and 3”).
- For figures and tables which are more than one page, repeat the figure or table number and title followed by “continued” in parentheses, for each additional page.

X.5.1.3 Measurement Units.

- All measurement units must be metric.
- Include U.S. equivalent measurements parenthetically.
- Use abbreviated standard units of measure when with a numeral, whereas, units of measure are to be spelled out if no quantity is given (e.g. “10 m” or “...meters”).
- Retain only the final unit of measure in a series (e.g. 10 to 15 kg).
- Use a “/” for ratios with numbers (e.g. 10 deer/ha) but use “per” for ratios without numbers (e.g. deer per hectare).

X.5.1.4 Numbers.

- Numbers from one through nine are written out; numbers above nine are expressed as numerals except when first word of sentence. Ordinal numbers (e.g. second, 23rd) are treated the same.
- Physical measurements (length, width, distance, area, volume, decimals, percentages, degrees, symbols, latitude/longitude, fractions over one) and time (days, years) are always expressed as numerals.

X.5.1.5 Taxon Names.

- The NPS has adopted ITIS (Integrated Taxonomic Information System) as its standard for taxonomy and nomenclature, and all scientific names should follow that standard. See http://www.itis.usda.gov/plantproj/itis/index.html
- Use common species names of plants and animals initially followed with scientific names parenthetically; thereafter, only the common name is necessary.
- If a large number of species are referred to in the text, a reference list of common and scientific names must be included as an appendix.

X.5.1.6 Copyrighting. Authors are responsible for obtaining written permission for use of any copyrighted figures, tables, graphs, and information.

X.5.1.7 Errors. Authors are responsible for conducting an editorial review of the draft report to ensure: clarity; proper grammar, spelling, and punctuation; accuracy and completeness of all numbers, tables, figures, and references; and adherence to these format and content guidelines.

X.5.2 Formatting Guidelines

Draft final and final reports should adhere to the following format guidelines:

- double-sided on 8 1/2” x 11” white bond paper and in Word 6.0 (or more
- recent version) files on a CD-R.
- Start all first order sections on a new right hand page.
- Use Times New Roman 12 pt font throughout and avoid bolding text.
- Double-space draft final reports and single-space final reports.
- Allow 1" on all margins.
- Left-justify paragraphs without indentation on the first line and separate paragraphs from each
- other double-spaced.

- Final Report delieverd in both Word 6.0 or higher and Adobe PDF 5.x formats (600 dpi) on CD-R. CD-R will also have separate subdirectories with GIS data and digital photography, figures, Excel and Access databases.
- Do not hyphenate whole words at the end of a line, instead use an unjustified right margin.
- Number all pages sequentially at the bottom of the page, centered.
- The initial sections (Table of Contents, List(s) of Figures, Tables, and/or Appendices,
- Summary, and Acknowledgments) should be numbered sequentially using lower case
- Roman numerals (i, ii, iii, ...) with numbering beginning with, but not appearing on, the
- Title Page.
- The main body of the report (beginning with the Introduction) should be numbered
- sequentially using Arabic numerals (1, 2, 3,...).
- Blank pages are counted but not numbered.
- Use title case (i.e. first letter of all words capitalized except articles, prepositions and
- conjunctions) for all section headings.
- Use the following style for section headings:

First Order Header [center]
Second Order Header [flush left]
<u>Third Order Header</u> [flush left, underline]
Fourth Order Header: [flush left, colon, two spaces, continue with text]
Fifth Order Header [flush left, italicize]

X.5.3 Content Guidelines
The following list provides a general outline of first order headings for all draft and final reports. Each first order heading must begin on a new right hand page. These headings may vary or others may be added, but their order should approximate the following:

- Title Page
- Table of Contents
- List of Figures, tables and appendices
- Summary
- Acknowledgments [optional]
- Introduction
- Study Area
- Methods
- Results
- Discussion
- Conclusions
- Literature Cited
- Appendices [if applicable]

Following is a detailed discussion and examples of each section in the order they should appear of draft final and final reports.

X.5.3.1 Title Page. The following information must appear on the title page. An example title page is shown in Appendix X-4.

- Title [use title case and bold]
- Author(s) [first name, middle initial(s), surname; no professional titles or academic degrees;
- Avoid the use of "by"
- NPS Report Identification Code and Number [if assigned by designated NPS Key Official]
- Author's Organization Mailing Address
- Month/Year
- Month/Year of Update(s) [if applicable]
- Contract or Agreement Number [include Supplemental Agreement Number, if applicable]
- Appropriate Regional or Support Office Mailing Address

X.5.3.2 Table of Contents. Include a table of contents with all first and second order section headings with the following format guidelines:

- Include only first and second order section headings in the Table of Contents.
- Include all first and second order section headings that follow the Table of Contents (i.e. beginning with and including headings for lists of figures, tables, and/or appendices).
- Use title case on all entries.
- Double-space between section heading entries.
- Indent second order section headings from first order section headings 7 spaces.
- A space followed by a line of dots followed by a space should proceed from the last word of each entry to a right justified page number.
- Allow page numbers to "stand alone" on the right side of the page by spreading longer entries to additional lines, making sure that each line of the entry is indented to the same starting point as the first word of the entry.
- Repeat the heading (i.e. Table of Contents) followed by "continued" in parentheses at the top and centered for each additional page of the Table of Contents.
- Consult appendix X-5 for an example table of contents.

X.5.3.3 Lists of Figures, Tables, and Appendices. Include a separate list for each set of figures, tables, and/or appendices that are included in the report.

- Each of these lists must begin on a new right hand page.
- Double-spacing between entries.
- Begin entries with a capitalized label followed by a space then a number (for figures and tables) or capitalized letter (for appendices) then a period then a double space then a title.
- If there is only one appendix, do not include a List of Appendices page; list it as the last entry in the Table of Contents as "Appendix" with no letter afterward.
- A space followed by a line of dots followed by a space should proceed from the last word of each entry to a right justified page number.

- Allow page numbers to "stand alone" on the right side of the page by spreading longer entries to additional lines, making sure that each line of the entry is indented to the same starting point as the first word of the entry.
- Use sentence case (i.e. capitalize only the first letter of the first word and any proper nouns) for titles.
- Repeat the heading (e.g. List of Figures) followed by "continued" in parentheses at the top and centered for each additional page of the list.
- Consult Appendices X-6 for example lists.

X.5.3.4 Summary. This "stand alone" section should summarize the prominent facts discussed in the report and the conclusions reached in relation to research objectives. It should be as brief as possible, yet cover the subject in a clearly written, non-technical style so that, on its own, this section tells the reader what the project was about and what conclusions were made. This section is often removed from the report and used by the park Superintendent to inform legislators, public individuals and organizations, and NPS park, regional, and Washington Office staff of the completion and results of the study.

X.5.3.5 Acknowledgments (optional). Briefly acknowledge those who directly helped with research or writing. Acknowledgments of typists, illustrators, editors, and referees may be included, but generally are discouraged. Use only forename initials with surname(s) and do not include professional titles or academic degrees.

X.5.3.6 Introduction. The introduction should include the hypotheses and purpose of the investigation, research objectives, conditions under which the study was conducted, the general plan of treatment of the subject, and summary of previous work accomplished (literature review) that relates to the project.

X.5.3.7 Study Area. Provide a concise narrative description and justification of the study area(s) for the research. Include a detailed map of the study area(s) for further clarity.

X.5.3.8 Methods. Present a detailed explanation of the methods, materials, and analytical techniques that were used in the field, laboratory, and office during the study. Describe how, when, where, and by whom the data were acquired for the investigation. The methods should be documented so that the investigation could be exactly repeated, if necessary. Be sure to include how data were analyzed and what statistical tests were employed. Describe the process used for determining whether the data met the data quality objectives and, if not, what corrective actions were taken. Detailed information about QA/QC procedures for data collection, verification, and validation should be placed in an appendix if it is too lengthy and detracts from the main body of the text.

X.5.3.9 Results. In a logical sequence, present, in detail, the findings of the study that either support or provide evidence against the hypotheses or that answer the question(s) presented in the "Introduction". Basic descriptive statistics (sample size, percentages, mean, median, maximum, and minimum) are appropriate when clearly presented. Avoid technical discussions of complex statistical testing; instead refer readers who may be interested in this type of information to an appendix.

X.5.3.10 Discussion. This section and the "Conclusions" section are the most important parts of the report. Present a clear interpretation of the data that addresses the hypotheses, objectives, or purpose for which the study was conducted. Be sure to include how this research is applicable to the park where it took place, and to other studies that have been conducted in that area of research. Other findings may be reported that would be of general interest to the scientific community.

X.5.3.11 Conclusions. Provide a specific and detailed summation of the conclusions of the research. In some instances, this is one of the few parts of the report that park managers will read. If the research was initiated due to specific park management needs, management implications should be emphasized and thoroughly discussed.

Recommendations regarding policy positions of the agency should not be included. If desired, recommendations of this nature should be covered in a special supplementary report separate from the scientific report.

X.5.3.12 Literature Cited. List all references in the "Literature Cited" section of the report using the Council of Biology Editors (CBE) bibliographic style as outlined in Appendix X-7.

X.5.3.13 Appendices. Include supplementary materials (e.g. QA/QC procedures) that support the main body of the report. The following guidelines apply:

- Each appendix must begin on a new right hand page
- Appendices are labeled sequentially with capitalized letters (e.g. "Appendix A", "Appendix B", etc.) followed by a brief concise title in sentence case at the top of the page and centered.
- A single appendix is labeled "Appendix."
- If possible, the title should appear on the same page with the appendix material; if not, the title can be placed centered on the top of the preceding right hand page.
- For appendices that are more than one page, repeat the title at the top and centered, followed by "continued" in parentheses, for each additional page.

Appendix X-3: Example Dataset Catalog Entry Form

Copy and use a separate form set for each data set. Complete all fields. Numbers after field names are the sizes of the fields.

Dataset Title (150)**:** _____

Citation Info: (**Use Citation Form** or Author/Origin, Date, Ver./Ed., Series, Issue, Pub. Place, Publisher, Larger Work Cit.):_____

_____

Project ID (20): _____

Data Originator (Name/Source, Position, Affiliation, Address, Phone, Fax, E-mail)**:** _____

_____

_____

Dataset Contact (Name/Source, Position, Affiliation, Address, Phone, Fax, E-mail)**:** _____

_____

_____

Subject (30): _____ **Keywords** (100): _____

_____

Dataset Abstract: (250): _____

_____

_____

_____

_____

Dataset Purpose (250): _____

_____

_____

_____

_____

Related Data (**# of Citation Forms** or Author/Origin, Date, Ver./Ed., Series, Issue, Pub. Place, Publisher, Larger Work Cit.): _____

_____

Related Document(s) (**# of Citation Forms** or Author/Origin, Date, Ver./Ed., Series, Issue, Pub. Place, Pub., Larger. Work Cit.):_____

_____

Single/Begin Date: _____ **End Date**: _____

Update Frequency (10): _____

Multiple Dates (Date/Time):_____

Status (10): New __ Active __ Inactive __ Partial __ Legacy __ Historic __ Other _____

Progress of Work on Data Set: Planned __ In Work __ Complete __

Location (100): _____

_____

W. Longitude (Dec. Degrees): _____

N. Latitude (Dec. Degrees): _____

E. Longitude (Dec. Degrees): _____

S. Latitude (Dec. Degrees): _____

UTM Zone (Optional): _____

W. Easting (Opt.): _____

N. Northing (Opt.): _____

E. Easting (Opt.): _____

S. Northing (Opt.): _____

Coverage (6): In __ Out __ In&Out __ Park Clip __ Park Area __ NPS-wide __ Region-wide __

Other _____

Data Type (6): GEORAS __ GEOVEC __ GEODB __ DIGRAS __ DIGVEC __ DIGDB __ ANAORG __

ANAUNO __

Data Type 2 (20): Polygon __ Line __ Point __ DEM __ Raster __ DOQ __ Landsat __ Imagery __

Spreadsheet __Database __ Document __ Delimited text __ Tagged text __ ASCII text __

Other _____

Coordinate System: UTM __ Lat/Lon __ State Plane __ Other _____

Datum: NAD27 __ NAD83 __

Source/Attribute?, Table/Layer Name (50 each) **Optional Table Page(s)?, Scale Denominator, Cit.?**

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source or Attribute, _____ , ___ , _____ , ___

Source(s) Contribution (Also use Citation Form and attach pages as needed, 250): _____

_____

Data Format (80): Paper __ dBASE __ Access __ Lotus __ Excel __ WordPerfect __ Word __ ASCII __ or Other (list): _____

Conversion Needed? Yes or No **File Size** (50)**:** _____

File Location (100): _____

Data at Park? Yes or No **Distribution Costs**: None __ Other _____

Distribution (100): _____

Online Link URL (150): _____

Quality (15): Unknown __ *Not* Ver./Val.(?) __ Verified __ Validated __ Metadata __

Quality Report: (250): _____

_____

_____

_____

_____

Metadata Status: None __ Planned __ In Work __ Complete __

Metadata Priority: High __ Medium __ Low __

Metadata Standard: FGDC __ NPS Dataset Catalog __ None __ Other _____

Metadata Link URL (150): _____

Metadata Contact (Name/Source, Position, Affiliation, Address, Phone, Fax, E-mail)**:** _____

_____

_____

Is the Dataset Sensitive? Yes or No **If So, How is the Dataset Sensitive?** Archaeology __ Cave __ Classified __ Law Enforcement __ Paleontology __ T&E Species __ Other _____

Classified Data Type: N/A __ Unclassified __ Sensitive __ Restricted __ Confidential __ Secret __ Top Secret __

Access Restrictions (12): Public __ Fed. Only __ NPS Only __ Park Only __ Contact Only __

Comments: (250): _____

_____

_____

_____

Appendix X-4: Example Title Page for Draft Final and Final Reports

FLORA OF PETERSBURG NATIONAL BATTLEFIELD

Michael S. Rosenweig
and
Duncan M. Porter

Technical Report NPS/PHSO/NRTR-98/075

Department of Biology
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061-0324

January 1991
Revised September 1993

Cooperative Agreement
4000-9-8014
Supplemental Agreement 4

National Park Service
Northeast Region, Philadelphia Support Office
Stewardship and Partnerships
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

Appendix X-5: Example of Table of Contents for Draft Final and Final Reports

Appendix X-6: Example lists of figures, tables and appendices.

List of Figures

List of Tables

List of Appendices

Appendix X-7: Council of Biology Editors (CBE) bibliographic style format and examples.

Journal Article

Format

First author Surname, Forename initial Middle initial(s)., and Second author Forename initial Middle initial(s). Surname. Publication date. Article title. Journal title. Volume number(Issue number):page number-page number.

Example

Kinbote, C. V., and D. N. Haze 1948. A new species of Cyclarus Nabokov. The Entomologist. 81(1027):273-280.

Book

Format

First author/editor Surname, Forename initial Middle initial(s)., and Second author/editor Forename initial Middle initial(s). Surname, editors [if applicable]. Publication date. Title of book. Edition number. Publisher, City of Publication, State/Country of Publication. number of pages pp.

Example

Knight, S. V., and V. N. Darkbloom, editors. 1998. Butterfly identification in our National Parks. Second edition. Blackwell Scientific Publications, Ithaca, New York. 512 pp.

Report

Format

First author Surname, Forename initial Middle initial(s). and Second author Forename initial Middle initial(s). Surname. Publication date. Title of report. Report Identification Number. City of Publication, State/Country of Publication. number of pages pp.

Example

Quilty, C. V., and A. N. Vokoban. 1961. A study of Lepidoptera at Shenandoah National Park. National Park Service Technical Report NPS/SHEN/NRTR-91/016. Luray, Virginia. 161 pp.

Chapter in Book or Paper in Conference Proceedings

Format

First author Surname, Forename initial Middle initial(s)., and Second author Forename initial Middle initial(s). Surname. Publication date. Title of chapter or paper. Pages page number-page number in First editor Forename initial Middle initial(s). Surname and Second editor Forename initial Middle initial(s). Surname, editors. Title of book or conference proceedings. Publisher, City of Publication, State/Country of Publication.

Examples

Chapter in Book:

Pnin, P. V., and H. N. Humbert. 1999. Yesterday's caterpillar: A re-examination of Lepidoptera morphology at Hopewell Furnace National Historic Site. Pages 131-313 in .S. V. Odon, and K. N. Krug, editors. Insect Studies in National Parks of the Eastern United States. University Park, Pennsylvania

Paper in Conference Proceedings:

Pnin, P. V., and H. N. Humbert. 1999. Yesterday's caterpillar: A re-examination of Lepidoptera morphology at Hopewell Furnace National Historic Site. Pages 131-313 in .S. V. Odon, and K. N. Krug, editors. Insect Studies 1998-1999. American Society of Entomologists. University Park, Pennsylvania

Thesis

Format

Author Surname, Forename initial Middle initial(s). Date of thesis. Title of thesis. Type of thesis. University. number of pages pp.

Example

Zembla, V. N. 1997. A comparative ecological study of Madeleinea mashenka and Madeleinea lolita in Northeastern National Parks. M. S. thesis, Cornell University. 242 pp.